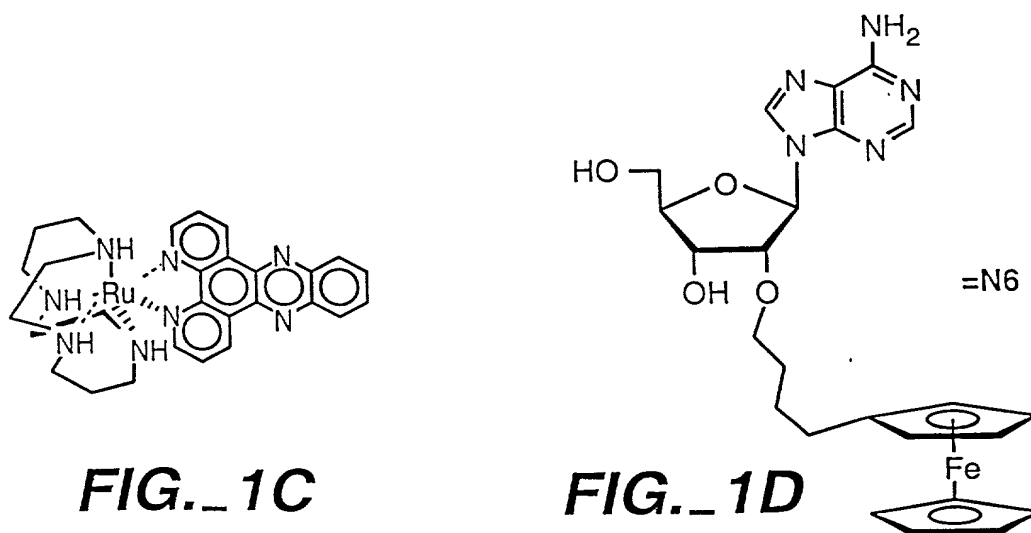
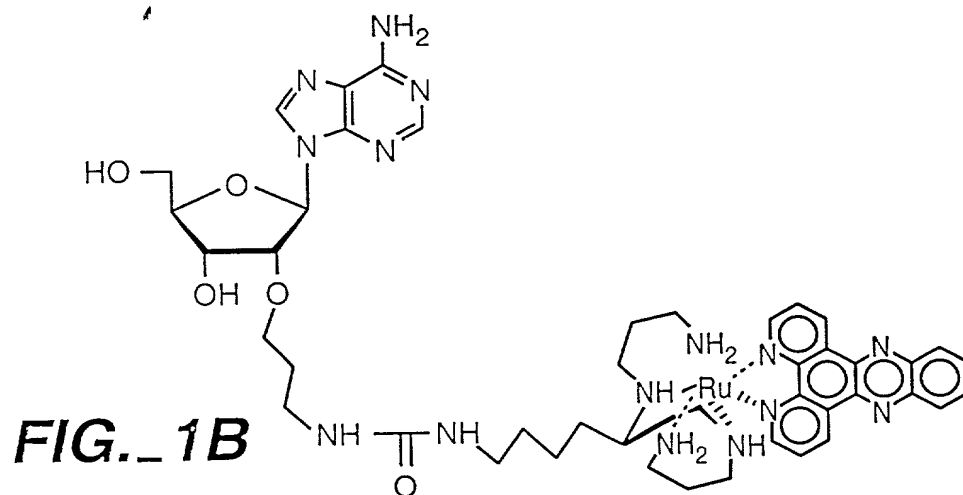
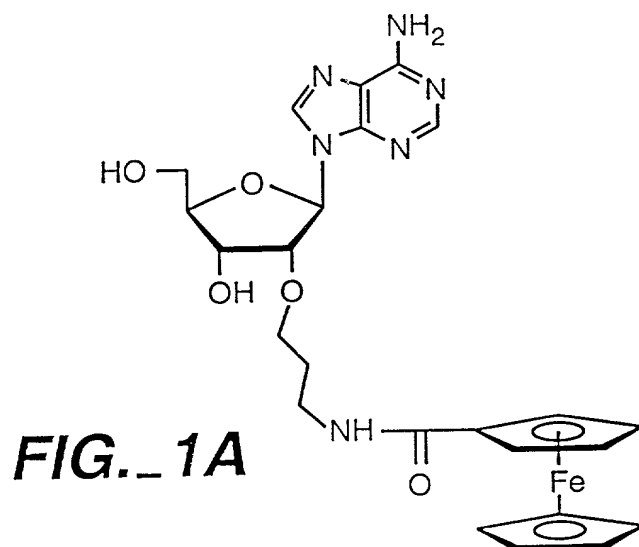
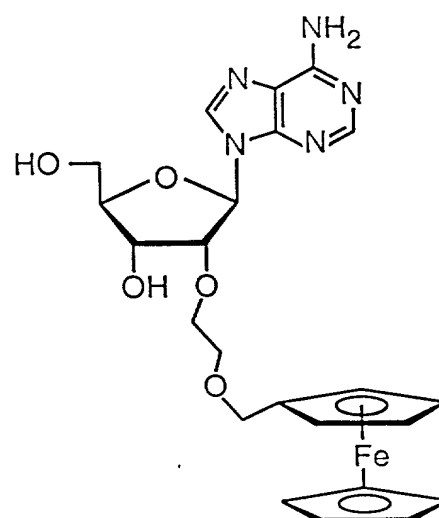
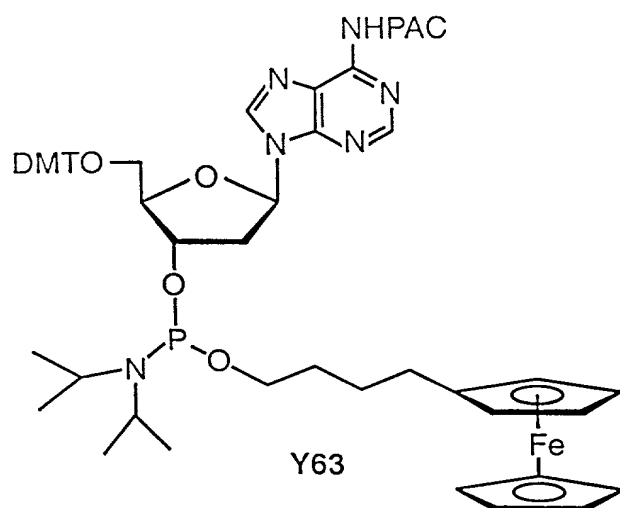
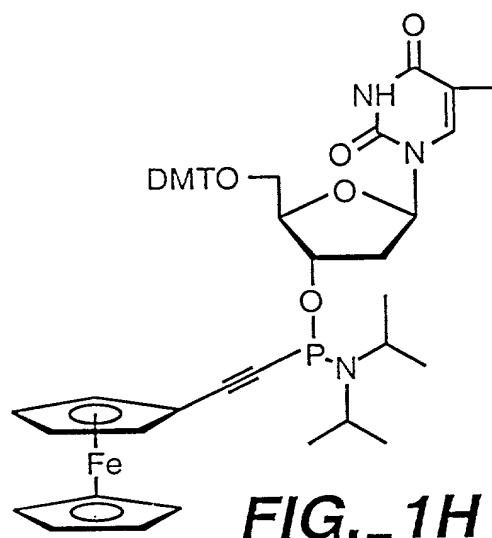
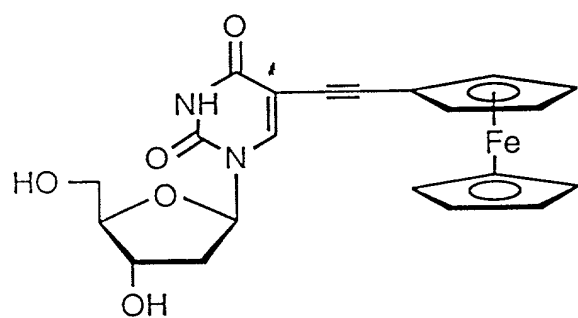
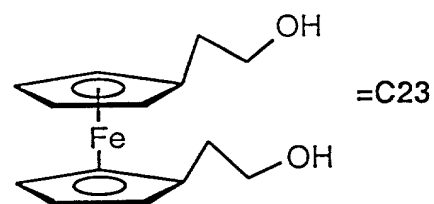
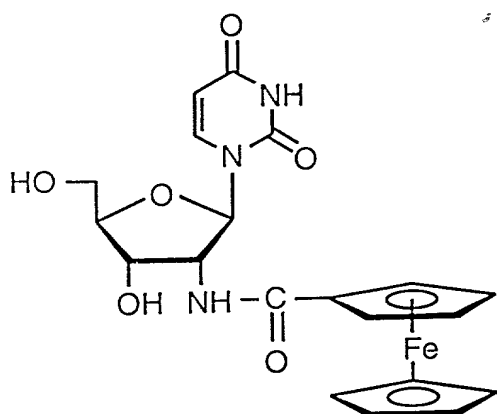
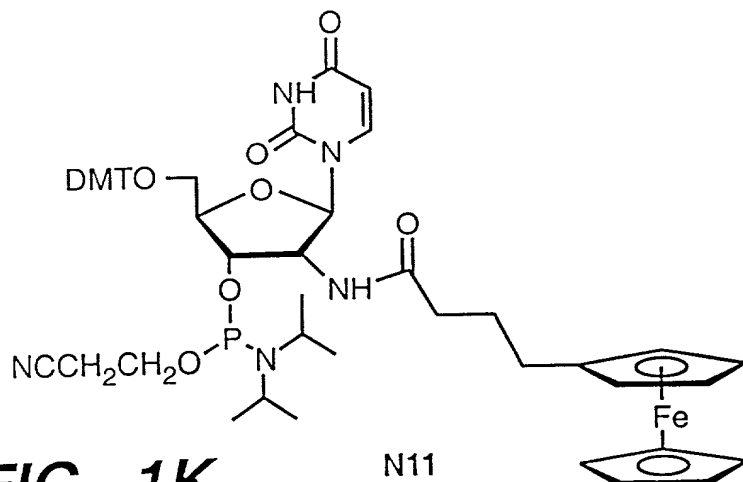


+







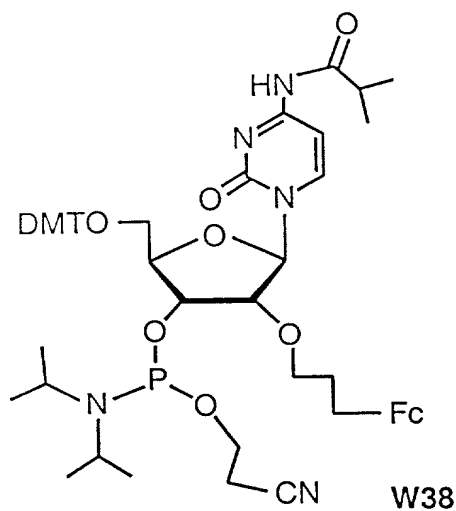
**FIG. 1K**

N11



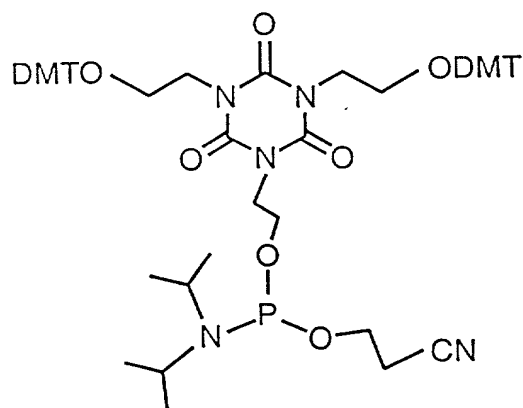
**FIG. 1L**

C131



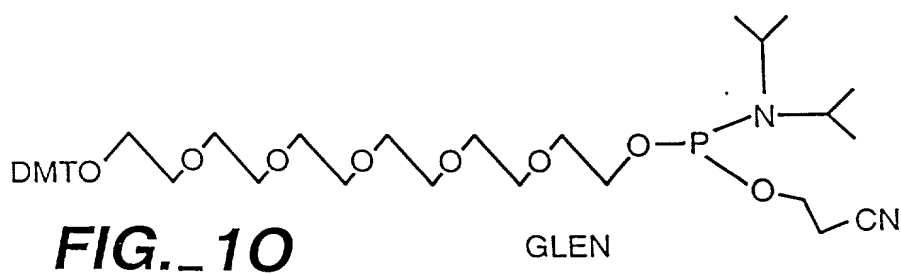
**FIG. 1M**

W38



**FIG. 1N**

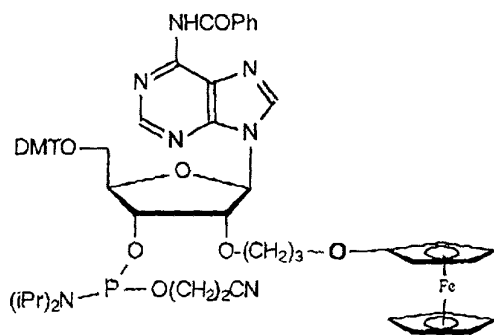
## BRANCHING



**FIG. 10**

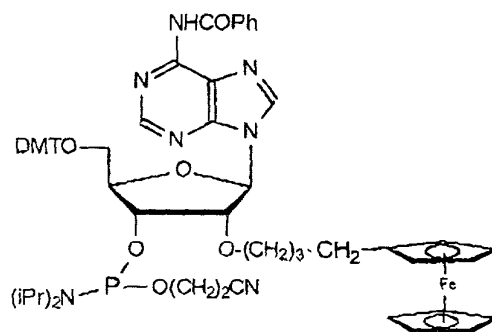
GLEN

Fig 1P



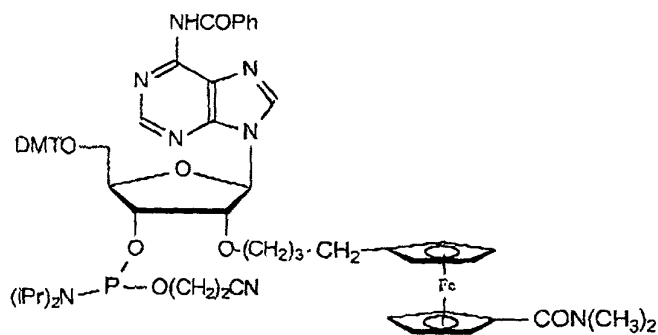
PS32

Fig 1Q



N6

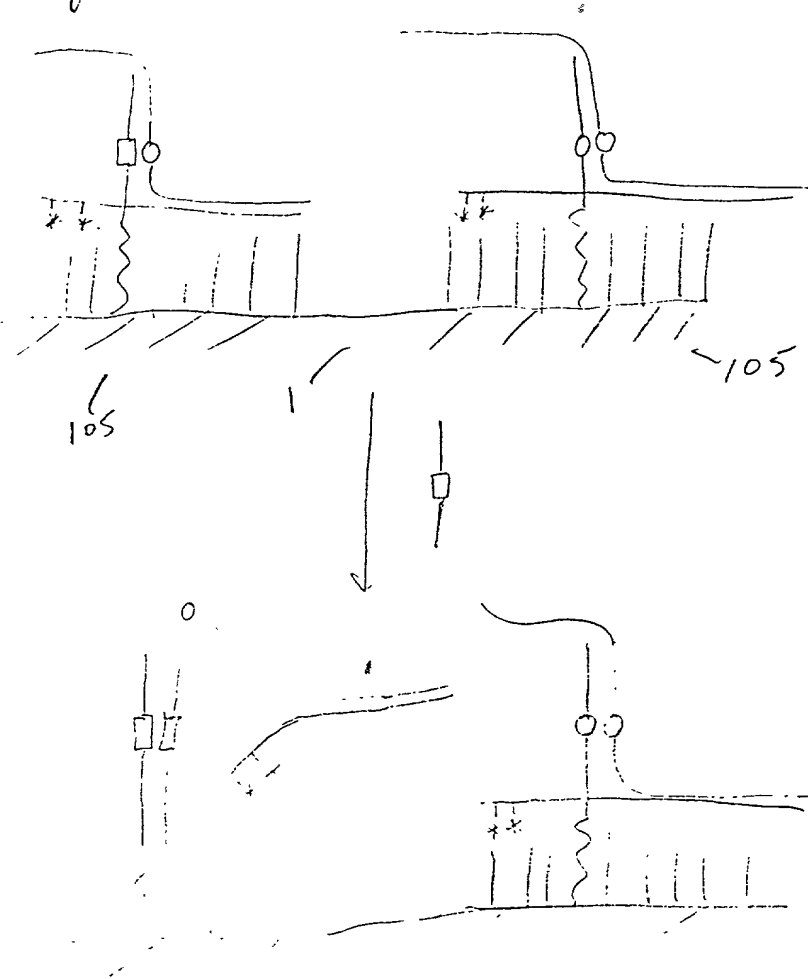
Fig 1R



W97

009220" 96092960

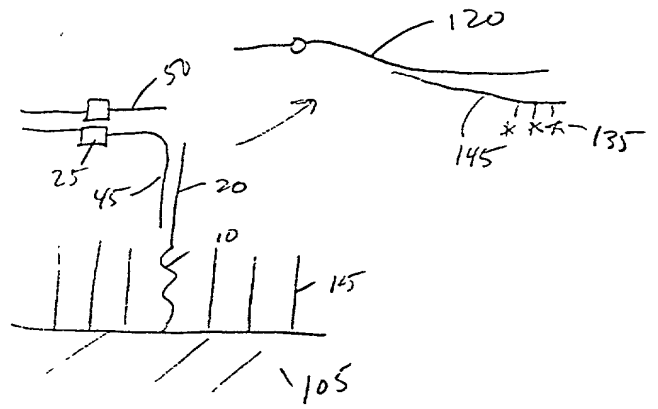
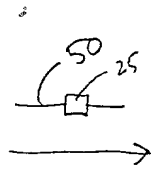
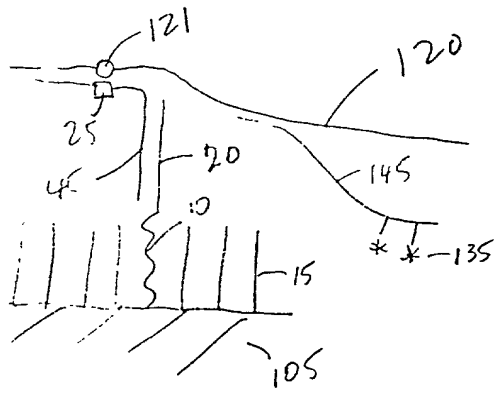
Fig 18



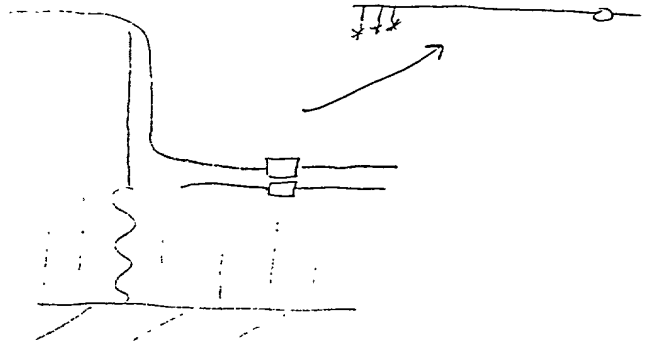
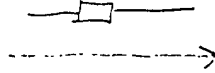
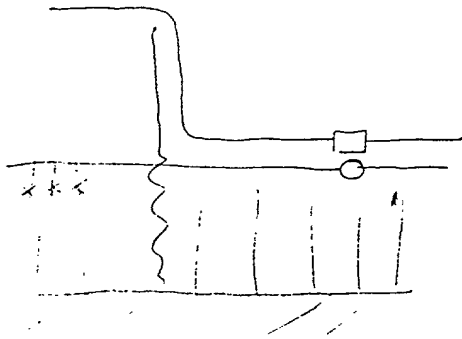
A

FIGURE 18 3

09626096 072600



B

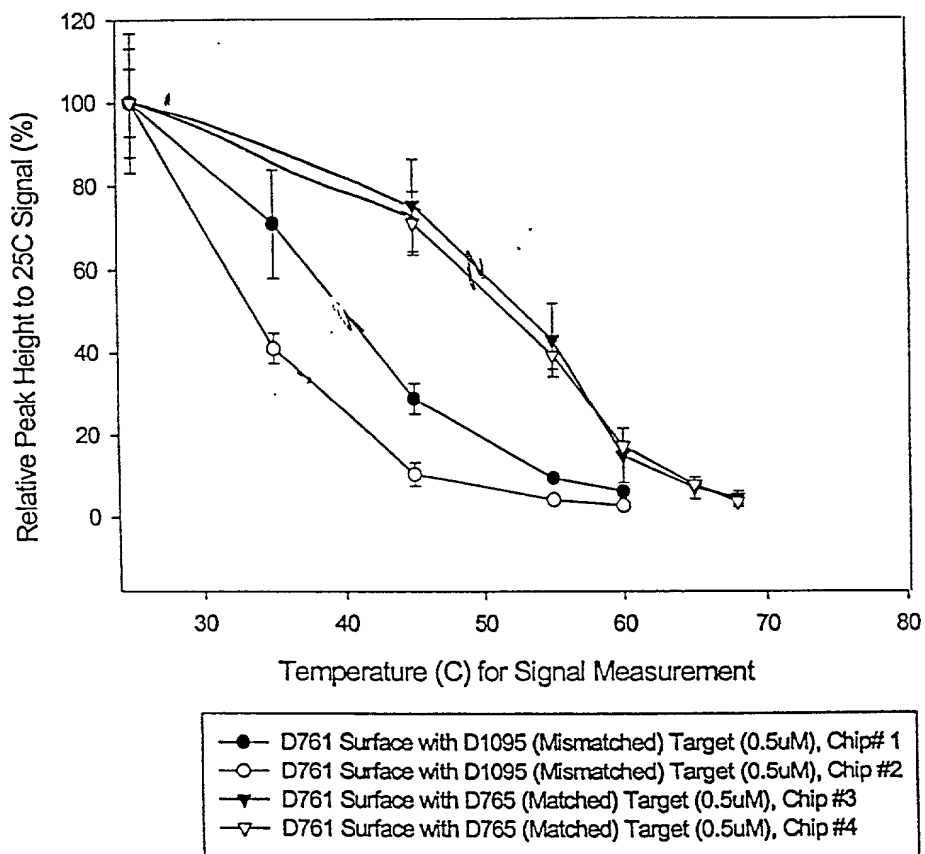


C

Fig 3, cont

Fig 4

TM for Mismatch and Perfect Matched HIV Sandwich



Signal Replacement from Mismatched Target to Matched Targets (0.25uM)

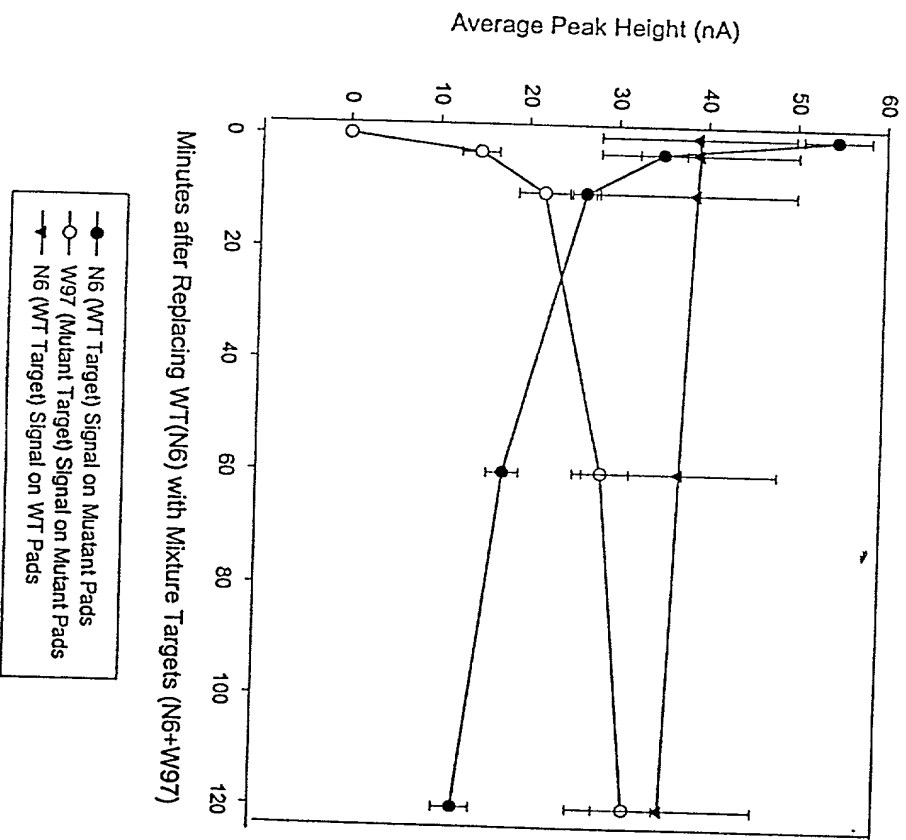


Fig 5

09026096 072600



# Electrochemical Signal from Ligated and Unligated DNA oligos

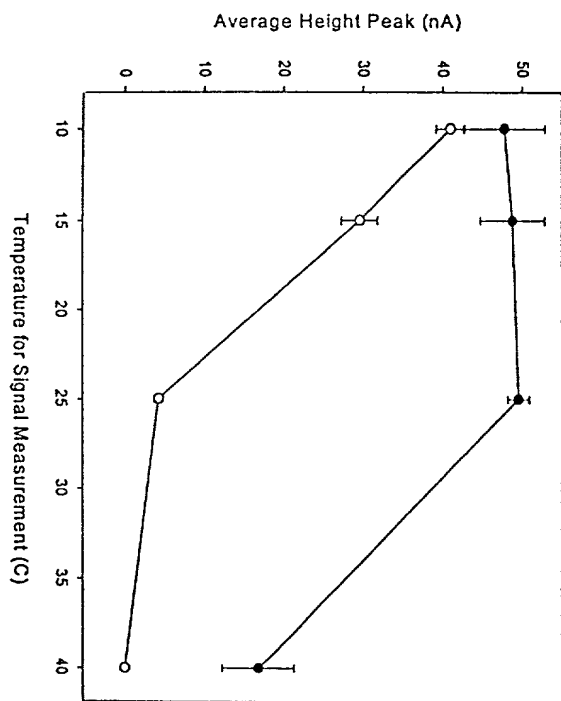


Fig 2A

000220 072600

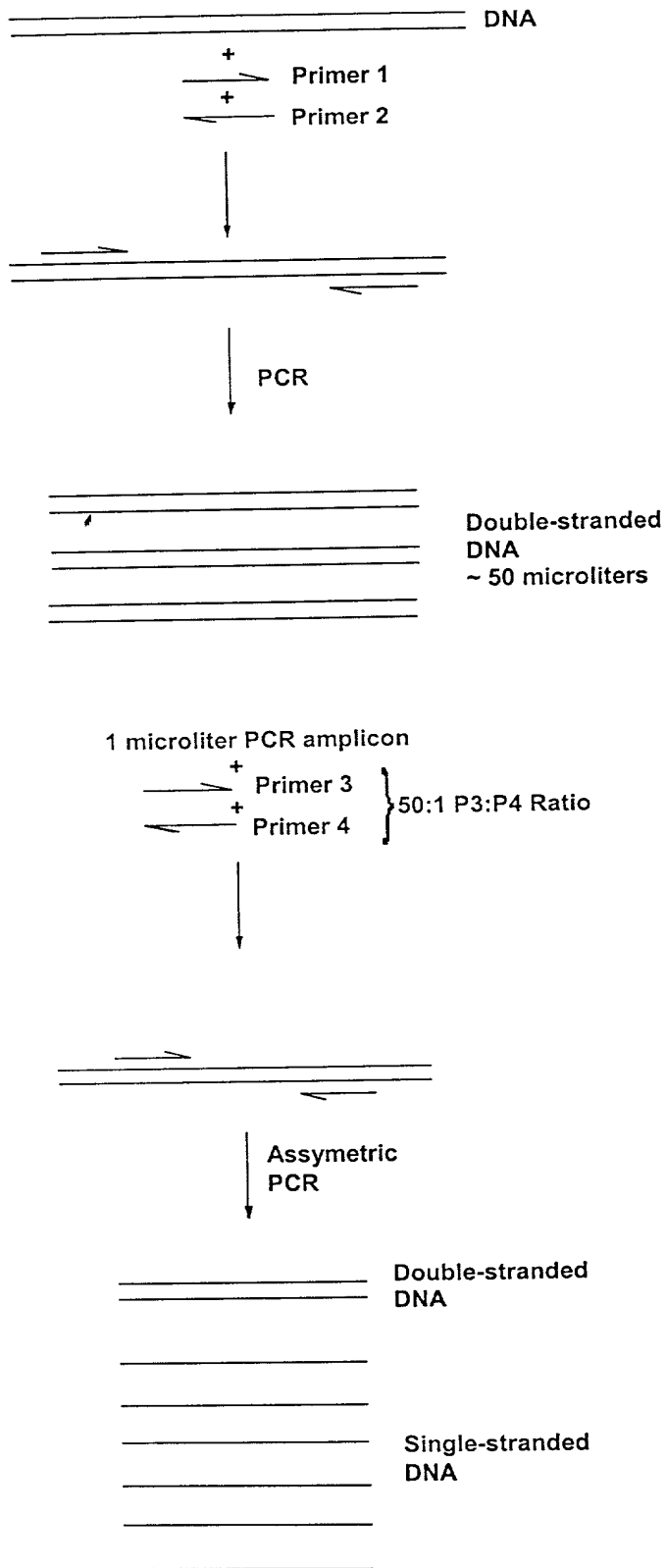
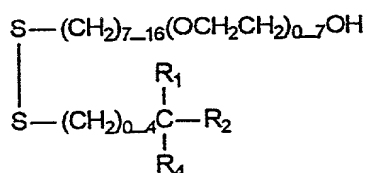


Fig 28  
7

**Scheme I, General Formula of Asymmetric Disulfides as Insulators**

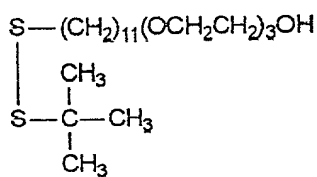
Fig 8A



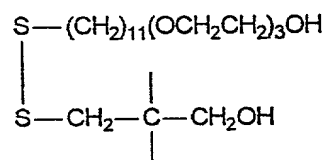
R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub>: H, CH<sub>3</sub>, *t*-butyl, cycloalkyl, CH<sub>2</sub>OH, CH<sub>2</sub>NH<sub>2</sub>, CONH<sub>2</sub>, COOH, CH<sub>2</sub>OPO<sub>3</sub><sup>2-</sup>, aromatic, adamantyl

**Two Examples of Insulators**

Fig 8B

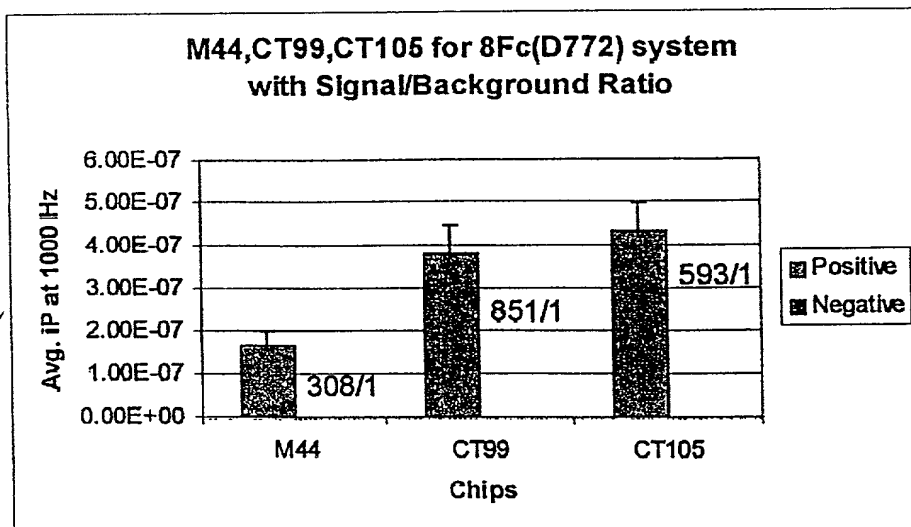


**CT99**



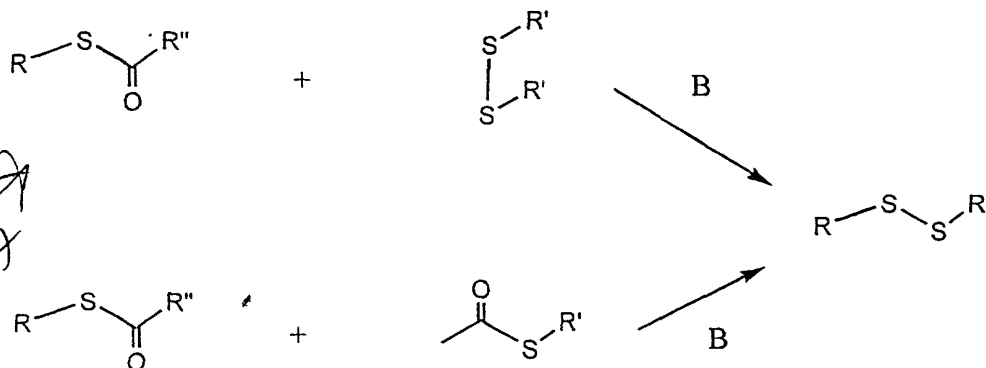
**CT105**

Fig 8C



be C1 to C20 alkyl or aromatic derivatives, R' could be any C1 to C20 alkyl or aromatic derivatives, and R'' could be any C1 to C20 alkyl or aromatic derivatives. B could any bases such as NaOH, KOH, LiOH, or MOR, here M as a metal.

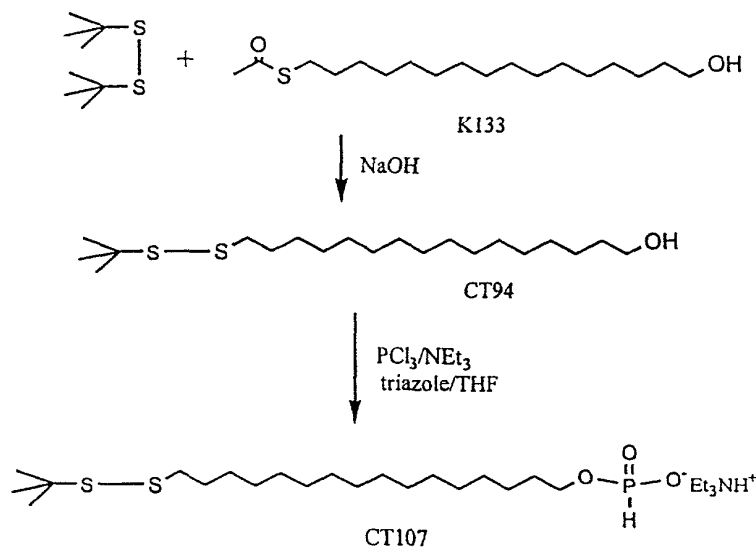
**Scheme 1**



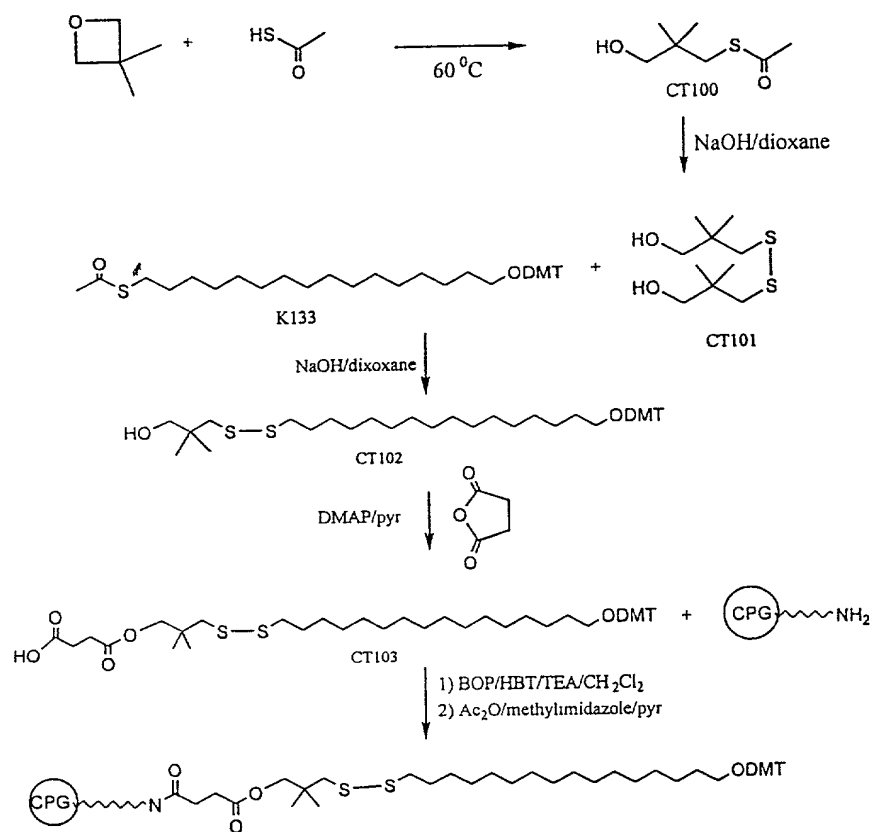
The detail invention was disclosed as the following examples. The new methods have been applied to the synthesis of H-phosphonate (Example 1), CPG (Example 2 and Example 3), and insulators (Example 4).

Example 3 compared the application of this invention to preparation of N150, which had been used to synthesize CPG with disulfide linkers. As the literature Method A, the synthesis of N150 from K136 will need four step transformations, however, N150 could be obtained in single step from K136 applying this invented Method B.

**Example 1**

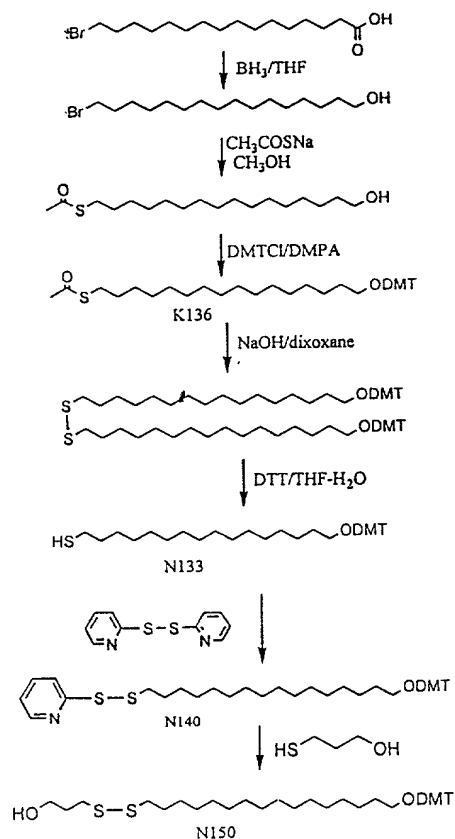


## Example 2

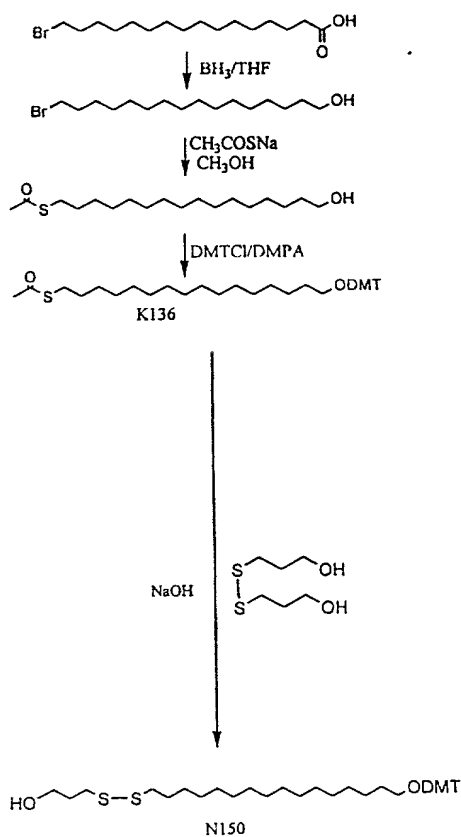


### Example 3

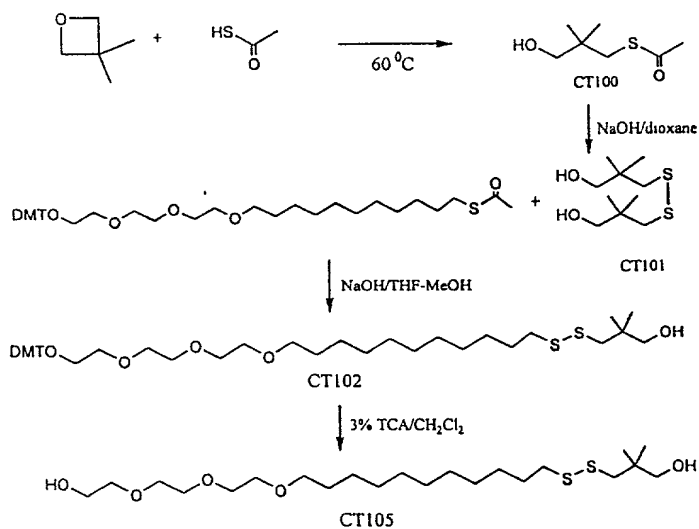
Method A



Method B



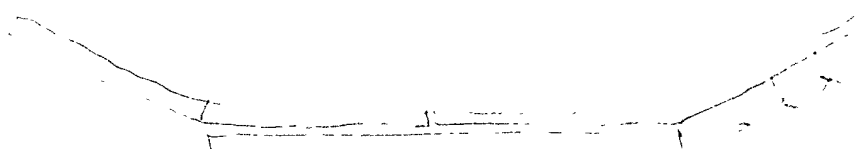
### Example 4





009220 96092960

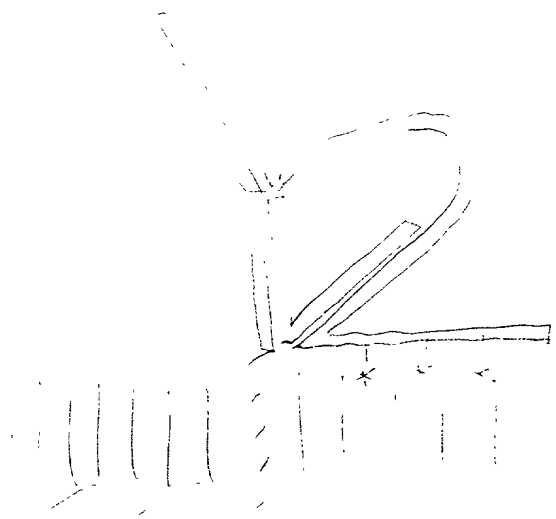
12 10



ligase



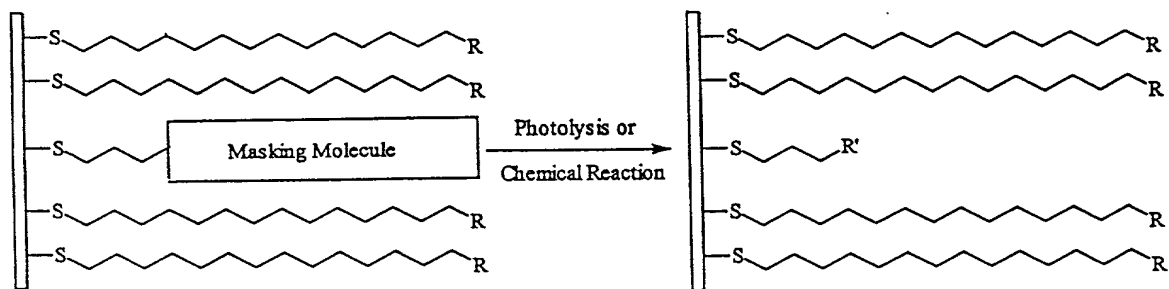
add  
ligase



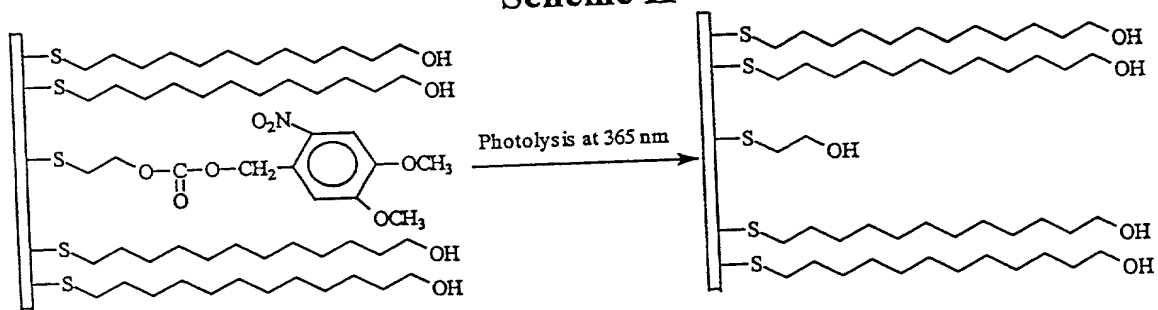


11

### Scheme I



### Scheme II



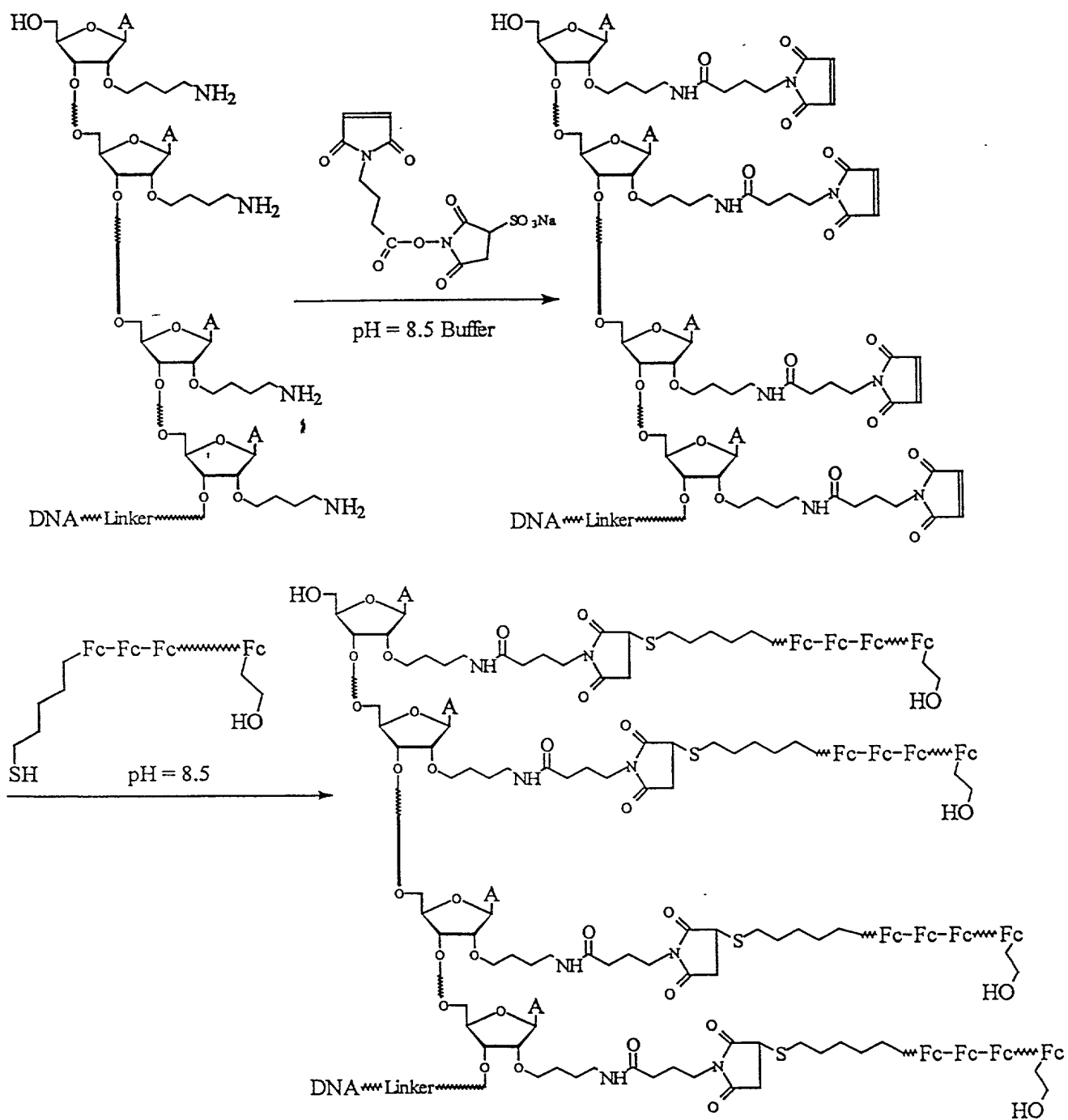
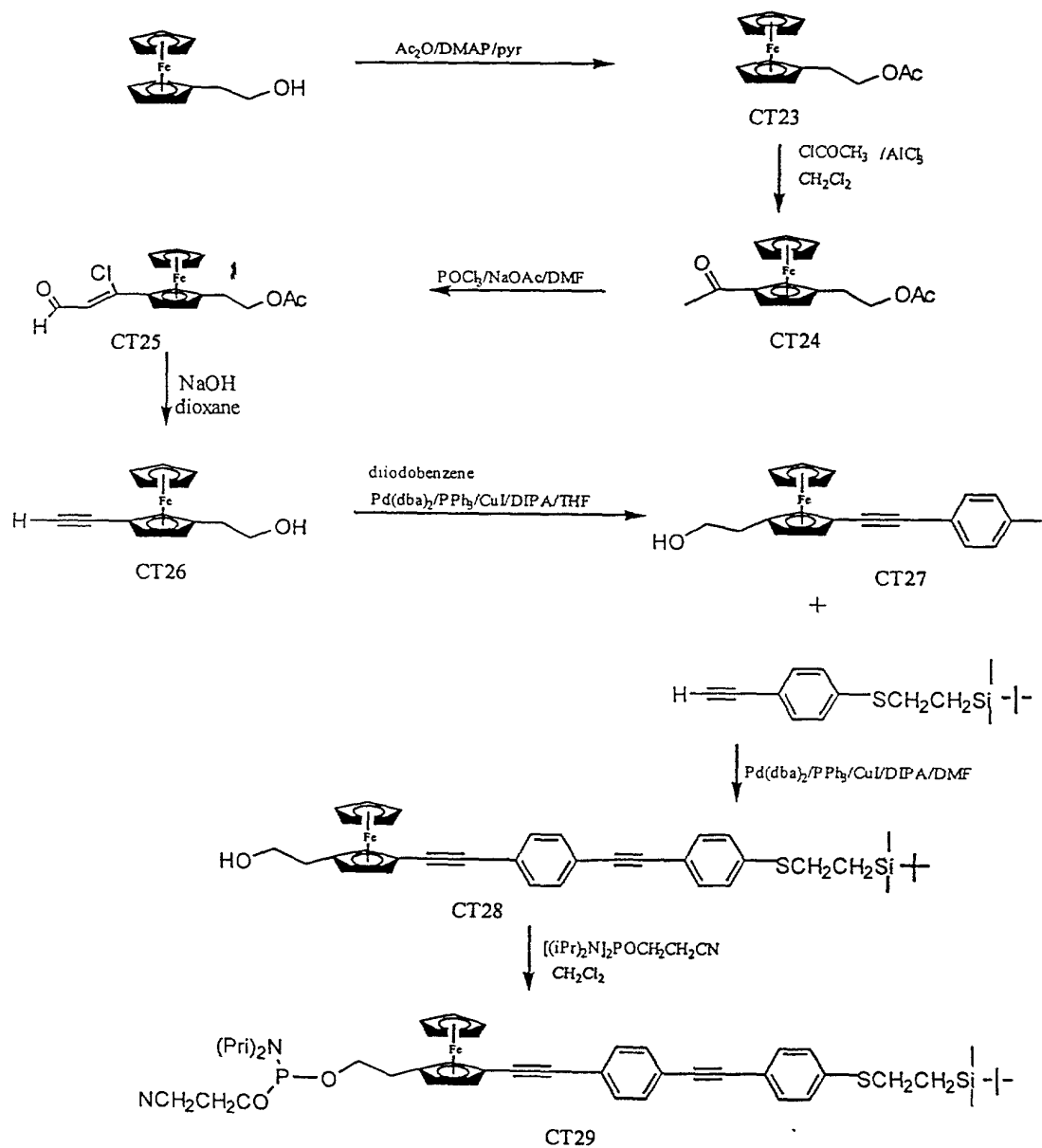
[illegible]



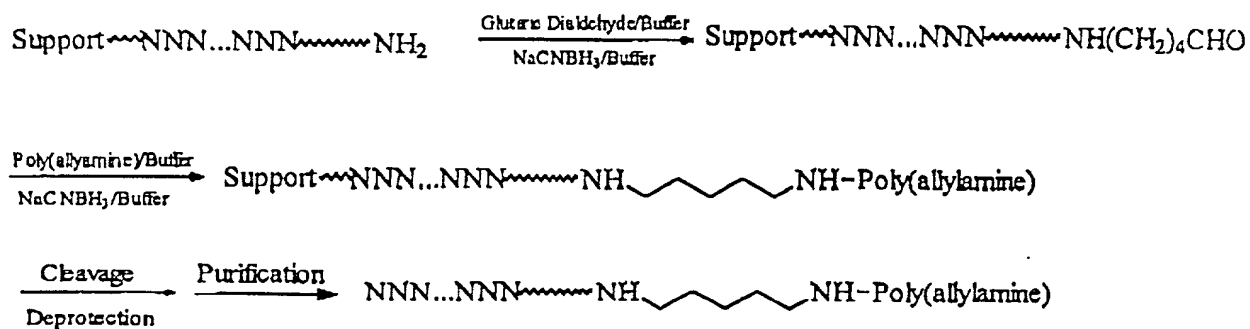
FIGURE 20

14

Scheme 1



# Scheme I, Introduction of Poly(allylamine) into DNA on Solid Phase



## Scheme II, Introduction of Ferrocenes After Hybridization

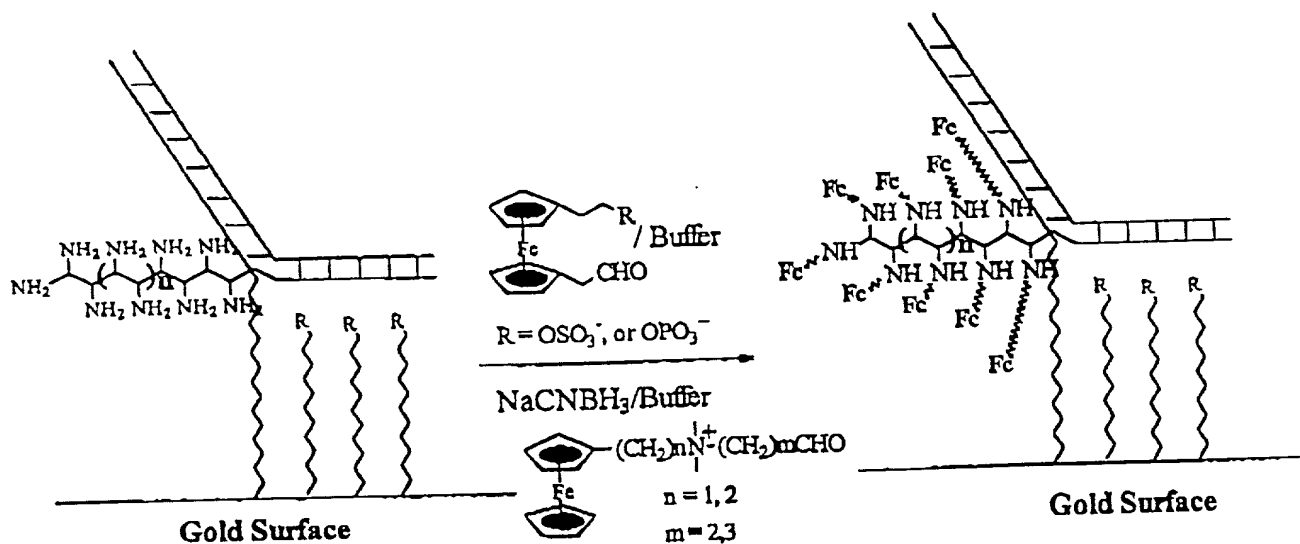
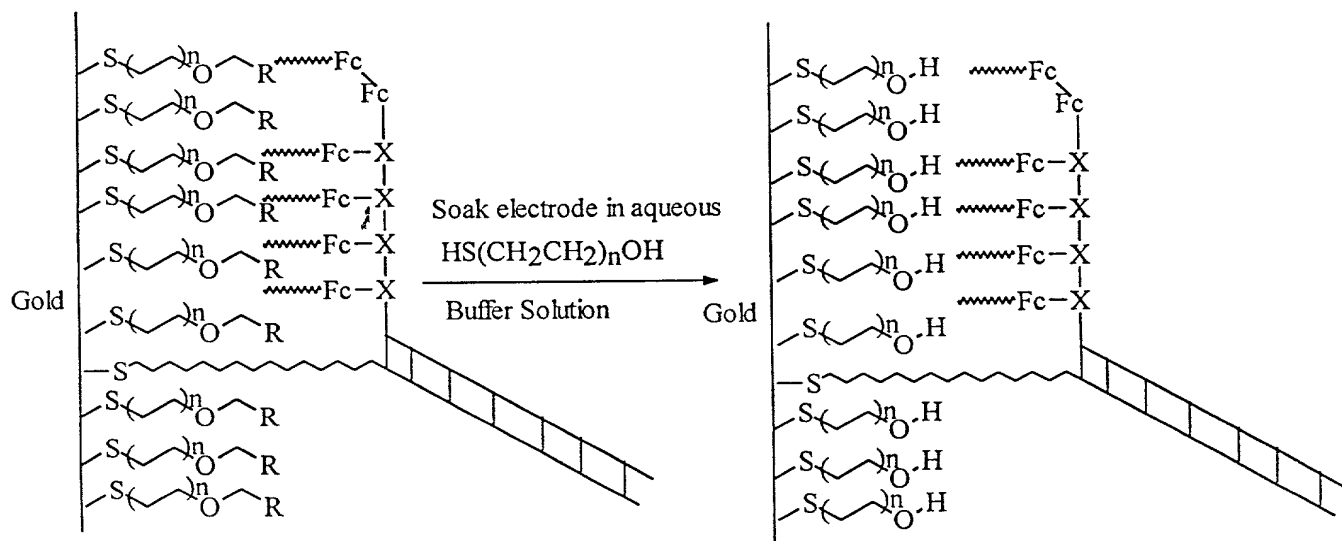


FIGURE 21  
15

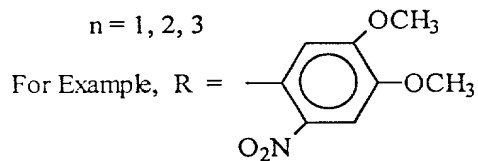
FIGURE 22

16

# Scheme I, Thiols Exchange Diagram



$n = 1, 2, 3$



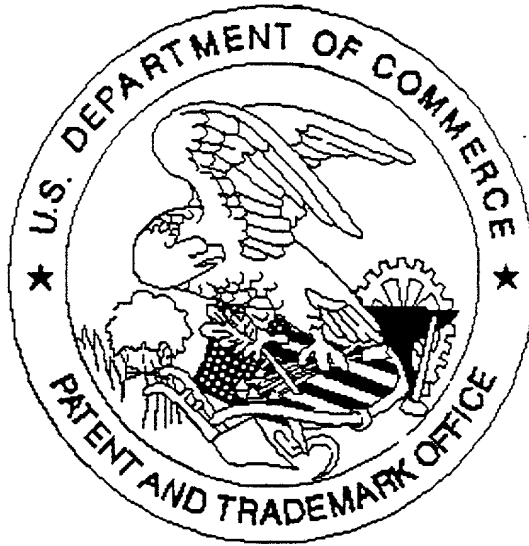
W150,  $n=1$ ,  $R = 4,5$ -dimethoxy-2-nitrobenzyl

C163,  $n=2$ ,  $R = 4,5$ -dimethoxy-2-nitrobenzyl

W155,  $n=3$ ,  $R = 4,5$ -dimethoxy-2-nitrobenzyl

$n = 1, 2, 3$

United States Patent & Trademark Office  
Office of Initial Patent Examination -- Scanning Division



Application deficiencies were found during scanning:

☐ Page(s) \_\_\_\_\_ of \_\_\_\_\_ were not present  
for scanning. (Document title)

☐ Page(s) \_\_\_\_\_ of \_\_\_\_\_ were not present  
for scanning. (Document title)

☒ Scanned copy is best available. *Drawings*